REMARKS

Applicants have cancelled claims 1-29 and replaced them with claims 30-54 which are in a better format conforming to U.S. patent practice.

Respectfully submitted,

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~~Comminuting Device~~

SUBSTITUTE SPECIFICATION

COMMINUTING DEVICE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] **This application claims the benefit of International Patent Application No. PCT/DE2003/009484 filed August 27, 2003, which claims priority to German Patent Application No. 102 39 820.8 filed August 29, 2002, both of which applications are hereby incorporated by reference in their entireties herein.**

~~Description~~

FIELD OF THE INVENTION

[0002] The invention relates to ~~a~~**devices for** comminuting**. In particular the invention relates to a** device, ~~including~~**which includes** a comminution chamber having a bottom wall and a circumferential wall projecting upward from the bottom wall, and **which is** additionally provided with a rotational drive shaft extending essentially orthogonal to the bottom wall and with at least one comminution element arranged neighboring to the bottom wall and capable of being set in ~~rotational~~**revolving** motion **about the drive shaft** by the drive shaft~~.~~

BACKGROUND OF THE INVENTION

[0003] Such comminuting devices are increasingly being employed in the recovery of raw materials. In particular, this may involve composite materials such as occur for example in the preparation for recycling of electric and electronic appliances or components, recycling monomaterials of ferrous metals, non-ferrous metals, synthetics or wood, fractions from other preceding coarse comminution processes in the recycling industry, or slags from processes of combustion.

[0004] A generic comminuting device is disclosed for example in EP 0,606,891 B1. This comminuting device includes a comminution chamber in which a rotor with vertical shaft is arranged. To this vertical shaft, immediately neighboring upon the bottom wall of the comminution chamber, two chains are attached as comminution elements. The comminution chamber is charged with material to be comminuted through an opening provided in the vicinity of its ceiling. When the material has been comminuted to the desired extent, a trap arranged in the circumferential wall of the comminution chamber near the bottom wall is opened to discharge the comminuted material. A disadvantage of this known comminuting device is that the material to be comminuted can only be comminuted batchwise, i.e. that the process of comminution is discontinuous.

[0005] ~~By contrast, one object of the invention is to furnish a comminuting device of the kind initially mentioned~~**Consideration is now being given to ways of improving comminuting devices and process. In particular, attention is directed to comminuting devices and processes** that can be operated continuously.

[0006] ~~This object is accomplished according to the invention by a~~**A** comminuting device ~~of the kind initially mentioned, in which, above the~~**which can be operated continuously is provided. The device includes a** comminution element neighboring upon the bottom wall, **and** a plurality of additional comminution elements **that are** capable of being set in revolving motion about the drive shaft by said shaft ~~are provided~~. This **configuration** ensures that the material to be comminuted that is charged in the comminution chamber is multiply exposed to the impact of the blows of the comminution elements before it arrives at the bottom of the comminution chamber. Thus, the material to be comminuted cannot simply fall to the bottom and leave the comminution chamber again through the discharge opening under the very first blow of a comminution element, as is possible in the case of the comminuting device disclosed in EP 0,606,891 B1. Instead, a plurality of blows ensures an adequate comminution of the material to be comminuted before it arrives in the discharge area. Therefore, the material to be comminuted can be charged into the comminution chamber continuously.

[0007] Since the comminuting device according to the invention is preferably also employed for pre-comminution of the material to be comminuted, and the principal or final comminution of the material comminuted by it takes place in a comminuting device distributed by Applicant under the designation *"~~Rotorprallmühle~~**Rotorprallmühle** RPMV"* [rotor impact mill RPMV] . it is tolerable if occasionally some not adequately comminuted object is discharged from the comminuting device according to the invention. Such an object, because of its size, can be separated in simple manner from the material discharged and returned to the comminuting device for renewed pre-comminution.

[0008] In order in simple manner to prevent the discharge of large objects, however, it is preferred that at least a portion of the circumferential wall be configured as a grating. This grating, which may be made up of a plurality of members preferably extending vertically, and arranged at a predetermined distance from each other, serves as a sieve, determining the size of material discharged from the comminuting device according to the invention. The material discharged from the comminuting device according to the invention is especially suitable as charging material for the *"~~Rotorprallmühle~~**Rotorprallmühle** RPMV"* if the value of the predetermined distance is about 38 mm. In order to withstand the 'bombardment' with material to be comminuted, i.e. in order to diminish wear on the members of the grating, the members may be made of wear-resistant steel or of cast material.

[0009] So that a controlled discharge of the material that has passed through the grating may be assured, the grating may be surrounded by an outer jacket. To prevent wires or similar fine objects from getting stuck in the space between the grating and the outer jacket, it is proposed that the outer jacket have a predetermined minimum distance from the grating, amounting for example to about 200 mm. In the space between the grating and the outer jacket, the comminuted material may drop onto a catch means preferably of funnel-shaped configuration, for comminuted material**, which is disposed at the bottom end of the outer jacket**. From this catch **means (e.g., a funnel-shaped** hopper), the comminuted material may then be discharged, downward, for example.

[0010] In addition to the circumferential wall, the bottom wall may also be configured as a grating, at least in part. The comminuted material passing through the bottom grating may also be discharged from the comminuting device by way of the funnel-shaped catch ~~hopper~~**means**.

[0011] In addition to the discharge by way of the funnel-shaped catch means, an opening openable and closable at will may be provided in the circumferential wall near the bottom wall, i.e. a discharge opening corresponding to the opening in EP 0,606,891 B1. As has already been explained above, this opening, if the comminuting device according to the invention includes neither a grating nor a catch hopper, may be the sole discharge opening of the comminuting device. Alternatively, however, it is possible also to use this opening as additional discharge opening. But in any case, this discharge opening may be used to empty the comminution chamber in event of overloading of the drive or blocking of the drive shaft. For opening and/or closing **of the opening at will**, a slide valve may be provided, dynamically actuable by means of a hydraulic cylinder. The size of the gap cleared by the slide valve may be used to influence the size of the material discharged or to influence the residence time in the comminution chamber of the material to be comminuted. Control of the size of this gap may be integrated into the over-all process of controlling the comminuting device.

[0012] To facilitate installation and maintenance work on the grating or/and the comminution elements, provision may be made for at least a circumferential segment of the outer jacket to be swingably arranged, preferably about an axis extending essentially vertical, or/and for at least a circumferential segment of the grating to be swingably arranged, preferably about an axis extending essentially vertical, or/and for a swingable circumferential segment of the grating and a swingable circumferential segment of the outer jacket to form a ~~single~~**jointly** manageable unit. This swingability may be provided by simple design and production techniques if the outer jacket has a polygonal, preferably an octagonal, contour. In the case of an octagonal contour, the comminuting device may for example be provided ~~as~~**with a** grating in **the region of** six of the eight sides of the comminuting device, whereas on the other two sides, preferably diametrically opposed to each other, functional parts may be provided, for example the **charge** opening for charging material to be comminuted and the discharge opening, making possible the complete emptying of the comminution chamber.

[0013] As is known *per se* from EP 0,606,891 B1, at least one comminution element, preferably the element neighboring to the bottom wall, may be made up of a chain. A comminution chain has the advantage that, when necessary, it can escape upward, diminishing wear on the bottom wall.

[0014] Moreover, however, it is also possible that at least one comminution element may be made up of an impact member. Impact members, compared to impact chains, have the advantage that they strike the material to be comminuted with greater momentum, and therefore comminute it more effectively. In order to make possible an escape of the impact members when necessary and thus keep them from breaking off, provision may also be made for the impact member to be articulately attached to the drive shaft, preferably swingably about an axis extending preferably parallel to the drive shaft.

[0015] If the comminution elements are helically arranged on the drive shaft, and this preferably in such manner that a comminution element closer to the bottom wall is arranged to run ahead of a comminution element more distant from the bottom wall in the direction of revolution **about the drive shaft**, then the comminution elements working together on the material to be comminuted can exert a force opposed to gravity. This leads to a prolonged residence of the material to be comminuted in the comminution chamber, and therefore to its better comminution. For this purpose, the drive shaft may, for example, be configured as a hexagonal shaft.

[0016] In development of the invention, it is proposed that the comminution elements be arranged on the drive shaft in planes of comminution elements, having a predetermined minimum distance between them, which may, for example, be about 120 mm. Here, the predetermined minimum distance ensures, firstly, that the suspension of the comminution elements on the drive shaft is of sufficiently stable construction, and secondly that even fairly large fragments of the material to be comminuted can move gradually between the comminution elements towards the bottom wall. In this way, it is ensured that all comminution elements can contribute to the comminution and therefore will wear down uniformly.

[0017] If between the free ~~end~~**end** of at least one of the comminution elements and the circumferential wall a predetermined distance is provided, then this can reduce the risk of a jamming or wedging of the material to be comminuted between the comminution elements and the ~~bottom~~**circumferential** wall, with favorable effects on wear of the circumferential wall, especially when this is configured as a grating.

[0018] If at least one ~~set of rings~~**annular attachment** is provided, projecting inward from the circumferential wall and preferably of funnel-shaped configuration, then the material that falls downward in the existing gap between the free end of the comminution elements and the circumferential wall can be returned to within reach of the comminution elements. Besides, the ~~set of rings~~**annular attachment** may be employed as protection for the fastening elements, preferably threaded bolts, with which the elements of the grating are fastened to ~~flats, bowed to serve~~**a bent flattened steel member serving** as suspension means.

[0019] In manner known *per se*, a charge opening may be provided in the region of the upper edge of the circumferential wall, for charging material to be comminuted. Such a charge opening may extend from the upper edge of the circumferential wall over a predetermined distance towards the bottom wall.

[0020] In this way, the material to be comminuted may be introduced at least in part laterally into the comminution chamber, reducing the free height to be provided ~~to within range~~**in the region** of the comminuting device according to the invention in view of the structural height of the comminuting device itself and the size of the material to be comminuted. As already suggested above, the charge opening is preferably provided in a circumferential ~~interval~~**region** of the comminuting device not configured with a grating.

[0021] In order to be able to prevent the material to be comminuted from being knocked out of the comminution chamber through the charge ~~element~~**opening** again upon first contact with a comminution element, only one comminution element may be provided in the uppermost plane of comminution elements, and also if desired in at least one additional comminution element plane arranged below. In addition or alternatively, at least the at least one uppermost comminution element may be of shorter configuration than the remaining comminution elements. Finally, a recoil of charged material may also be prevented in that a supply passage preceding the charge opening is of angled configuration.

[0022] In order to be able to secure a stable rotation of the drive shaft despite the plurality of comminution elements, it is proposed that the drive shaft be rotatably mounted both on the bottom wall and on a ceiling wall of the comminution chamber.

[0023] In manner known *per se*, the drive motor may be connected to the drive shaft by a belt drive. Here, this belt drive may equalize speed fluctuation of the drive shaft due to the impact loading in simple manner, so that these ~~feed~~**speed** fluctuations will not load the drive motor. The speed of the drive shaft may be between about 200 rpm and about 2,000 rpm, preferably between about 500 rpm and about 1,000 rpm.

[0024] Finally, ~~another~~**a connection** opening may be provided for connection of an exhaust device, preferably in a circumferential ~~interval~~**region** without grating. This ~~connecting~~**connection** opening may also be arranged behind an impact wall, so that wires and the like particles whose mass exceeds a predetermined value will not be aspirated, owing to their inertia.

BRIEF DESCRIPTION OF THE DRAWING

[0025] ~~In the following,~~**Further features of** the invention**, its nature, and various advantages** will be ~~illustrated in more detail by an embodiment by way of example, with reference to~~**more apparent from the following detailed description and** the accompanying drawings~~. In the drawings:~~**, wherein like reference characters represent like elements throughout, and in which:**

[0026] Fig. 1 represents a sectional view of a comminuting device according to the invention, at the line I-I in Fig. 3;

[0027] Fig. 2 represents a sectional view of a comminuting device according to the invention, at the line II-II in Fig. 3;

[0028] Fig. 3 represents a top view of a comminuting device according to the invention; and,

[0029] Fig. 4 shows a graph to illustrate the service possibilities of the comminuting device according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0030] **The present invention provides comminuting devices and comminuting processes. Features of an exemplary device and process are described herein with reference to Figs.. 1-4.**

[0031] ~~In~~ Fig. ~~1~~,**1 shows** a comminuting device according to the invention**, which** is quite generally designated **device** 10. It includes a comminution chamber 12 bounded by a circumferential wall 14, a bottom wall 16 and a ceiling wall 18. In the neighborhood of the bottom wall 16 and the ceiling wall 18, bearing locations 20 are provided for a drive shaft 22, driven by a drive motor 24 by way of a belt drive 26 in the direction of the arrow P (see Fig. 3).

[0032] On the therefore essentially vertical drive shaft 22, a plurality of comminution elements 28 are arranged in pairs in **comminution element** planes one above another. Only the two uppermost planes, i.e. comminution element planes next to the ceiling wall 18, comprise only a single comminution element 28. The comminution elements of the plane next to the bottom wall 18 are configured as impact chains 28a, while the remaining comminution elements are configured as impact members 28b. The impact members 28b are suspended **in** flying**/cantilever arrangement** on the drive shaft 22, i.e. swingable about an axis extending essentially parallel to the drive shaft 22. For the sake of clarity of the representation in Fig. 1, this is shown only for the impact member 28b' of the uppermost plane of comminution elements. The comminution element planes have a distance d_1 from each other (see Fig. 2).

[0033] In the representation according to Fig. 1 at the upper left, the comminution chamber 12 has an entrance 30 for the material to be comminuted. So that this material will not recoil into the entrance 30 immediately upon first contact with the impact members 28b, each of the uppermost two planes of comminution elements is provided with only one impact member 28b. In how many planes of comminution elements only one impact member 28b is provided depends on how far the entrance 30 extends downward ~~beyond~~**along** the height of the circumferential wall 14. Besides, the impact members 28b of the uppermost planes of comminution elements are configured shorter than the remaining impact members. This is indicated in Fig. 1 only for the uppermost impact member 28b'. In principle, however, the impact members 28b of several planes of comminution elements may be curtailed, and this preferably with a 'pine-tree-like' lengthwise staggering. How many comminution element planes are involved in the curtailment of the impact members depends among other things on how far the entrance 30 extends ~~beyond~~**along** the radius of the comminution chamber 12 towards the drive shaft 22.

[0034] By contact with the rotating impact members 28b, the material charged through the entrance opening 30 into the comminution chamber 12 is comminuted. Larger pieces here reside in the neighborhood of the entrance 30 until they are broken by the uppermost impact members 28b into fragments whose size depends among other things on the distance d_1 between the comminution element planes, the circumferential ~~spacing~~**offset** of the impact members of neighboring comminution element planes and the speed of the drive shaft 22. Then these fragments move **downward** by gravity through the various comminution element planes, ~~downward,~~ being further comminuted through the impact effect of the **impact** members 28b and/or the impact chains 28e.

[0035] Especially small fragments are flung radially outward against the circumferential wall 14 by the impact of the members 28b. This circumferential wall 14, as shown in Fig. 3, consists of a grating 32 composed of a plurality of grating members 32a arranged vertically. The grating members 32a have a **mutual** distance d_2 so that fragments whose dimensions are smaller than the quantity d_2 pass through the gratings 32 and can leave the comminution chamber 12. In order to ensure an orderly discharge of this comminuted material, the circumferential wall 14 and/or the grating 32 are surrounded by an outer jacket 34 opening at its bottom end 34a into a catch hopper 36. The lower opening 36a of the hopper 36 guides the comminuted material out of the comminuting device 10.

[0036] To prevent excessive stress and hence excessive wear on the grating members 32a by the ~~dragments~~**fragments** of material to be comminuted, a distance d_3 is provided between the free ends of the impact members 28b and the ~~peripheral~~**circumferential** wall 14 and/or the gratings 32. Owing to this distance d_3, which is greater than the distance d_2 of the members 32a, however, there is the danger that material not yet sufficiently comminuted may bounce off the grating 32 and drop between the grating 32 and the free ends of the impact members 28b onto the bottom plate 16. This would lead to an excessive stress on the impact chains 28a and the lowermost impact members 28b. Therefore, in this intervening space 33, two funnel-shaped annular attachments 38 are provided, which return material falling down into this space to the region of the impact members 28b. In this way, a uniform wear of all comminution elements 28 can be ensured.

[0037] If, owing to wrong choice of operating parameters, for example **a** too rapid ~~a~~ supply of the material to be comminuted, too slow a speed of the drive shaft 22, or the like, some excessive collection of not adequately comminuted material should nevertheless occur in the region of the bottom wall 16, then this undesired accumulation of material can be thrown out of the comminution chamber 12 through a lateral opening 40. This lateral opening 40 is closable by means of a trap 42, openable or closable at will by means of a hydraulic cylinder 44. A protective casing 46 provides for an orderly ejection of material without risk of danger to operating personnel.

[0038] Finally, Fig. 1 also shows a connection 48 for an exhaust device 49, aspirating dust and the like from the comminution chamber 12 and from the annular space 33 between grating 32 and outer jacket 34.

[0039] As shown in Fig. 3, the comminuting device 10 according to the invention, i.e. in particular its outer jacket 34, comprises an octagonal cross-section. Here the three **lower** side surfaces of the outer jacket 34 **in Fig. 3** and the circumferential segment of the grating 32 associated with them are combined into a unit 50, which can be swung away from the rest of the comminuting device 10 about a vertical axis A to afford access to the comminution chamber 12 and in particular to the drive shaft 20 and to the comminution members 28 for maintenance or operating personnel. Furthermore, each of the three side surfaces of the outer jacket 34 comprises a maintenance flap 54, affording access to the outside of the grating 32 after **being swung away from** the outer jacket ~~34 has been swung away,~~ **34,** for example, in order to replace individual grating members 32a. Similarly, the three upper side surfaces of the outer jacket 34 are combined into a corresponding unit 52 capable of being swung away from the remaining comminuting device 10 about the axis B.

[0040] In the circumferential segments corresponding to the remaining two side surfaces of the outer jacket 34, the drive motor 24 including the belt drive 26, the ejection opening 40, the entrance 30 and the connecting nozzle 48 for the exhaust device 49 are arranged. In these two circumferential segments, the circumferential wall 14 is configured continuously, i.e. without grating.

[0041] In Fig. 4, the conception of a comminution plant 60 is represented in the form of a process diagram, to be employed for recovery of raw materials including compound material, from equipment, such as refrigerators, washing machines, television sets, computers, motor vehicle parts or the like.

[0042] In this plant 60, the comminuting device 10 according to the invention serves for pre-comminution of the material to be comminuted. The final comminution takes place in another comminuting device 62, for example the comminuting device distributed by Applicant under the designation '~~*Rotorprallmühle*~~***Rotorprallmühle*** *RPMV*.' Depending on the material to be comminuted in each instance, it may be necessary or advantageous to precede the comminuting device 10 according to the invention with an additional comminuting device 64 for coarse comminution, for example the comminuting device disclosed in EP 0,606,891 B1.

On Detailed Course of Process

[0043] The material to be comminuted is introduced at 66 into the comminuting device 64 for coarse comminution. The coarsely comminuted material discharged **therefrom at 68** is supplied to a screener 70, which separates light material and discharges it at 72. The remaining material is supplied to the entrance 30 of the comminuting device 10 according to the invention for pre-comminution. The pre-comminuted material discharged by way of the catch hopper 36 is passed on to another screener 74, which again separates out light material.

[0044] To prevent clogging and hence blocking of the comminuting device 10, material not adequately comminuted is ejected through the lateral opening 40 and returned to the entrance 30 by way of the conveyor 41. If necessary, un-comminuted material may be separated out completely and discharged at 76.

[0045] Before the material provided by the screener 74 for principal comminution is supplied to the comminuting device 62 at 78 for final comminution, ferromagnetic parts are separated out in a magnetic separator 80 and discharged at 82.

[0046] The comminuting device 62 may also be operated in partial circulation, i.e. material not sufficiently comminuted may be returned by way of a conveyor 79 to the entrance 78 of the comminution device 62. Following the principal or final comminution, a further screening takes place in a screener 84 and a further separation of ferromagnetic particles in a magnetic separator 86, before the remaining finally comminuted material is supplied to a classifying device 88 and a sorting device 90. If, owing to inadequate physical separation various materials render impossible a classification of certain fractions of the comminuted material, then this unclassifiable fraction may be returned by way of a conveyor 89 to the entrance 78 of the comminuting device ~~62.~~62

[0047] **It will be understood that the foregoing is only illustrative of the principles of the invention, and that various modifications can be made by those skilled in the art without departing from the scope and spirit of the invention.**

Claims

1. Comminuting device (10), including

- A comminution chamber (12) having a bottom wall (16) and a circumferential wall (14) projecting upward from the bottom wall (16),
- A rotationally drivable drive shaft (22) extending essentially orthogonal to the bottom wall (16) and
- At least one comminution element (28a) arranged adjacent to the bottom wall (16) and capable of being set in revolving motion about the drive shaft (22) by said shaft (22), characterized in that, above the comminution element (28a) adjacent to the bottom wall (16), a plurality of additional comminution elements (28b) capable of being set in revolving motion about the drive shaft (22) by said shaft (22) are provided.

2. Comminuting device according to claim 1, characterized in that at least a portion of the circumferential wall (14) is configured as a grating (32).

3. Comminuting device according to claim 2, characterized in that the grating (32) is composed of a plurality of members (32a) preferably extending vertical, arranged at a predetermined distance (d_2) from each other, amounting to about 38 mm, for example.

4. Comminuting device according to claim 2 or 3, characterized in that the grating (32) is surrounded by an outer jacket (34).

5. Comminuting device according to claim 4, characterized in that the outer jacket (34) has a predetermined minimum distance from the grating (32), for example about 200 mm.

6. Comminuting device according to claim 4 or 5, characterized in that, at the lower end of the outer jacket (34), a catch device (36) of preferably funnel-shaped configuration, is provided for comminuted material.

7. Comminuting device according to claims 1 to 6, characterized in that, in the circumferential wall (14), an opening (40), adjacent to the bottom wall (16) and openable and closable at will is provided.

8. Comminuting device according to any of claims 4 to 7, characterized in that at least one circumferential segment of the outer jacket (34) is swingably configured, preferably about an axis (A) extending essentially vertical.

9. Comminuting device according to any of claims 2 to 8, characterized in that at least one circumferential segment of the grating (32) is swingably configured, preferably about an axis (A) extending essentially vertical.

10. Comminuting device according to any of claims 4 to 9, characterized in that a swingable circumferential segment of the grating (32) and a swingable circumferential segment of the outer jacket (34) form a ~~single~~**jointly** manageable unit (50).

11. Comminuting device according to any of claims 4 to 10, characterized in that the outer jacket (34) comprises a polygonal, preferably an octagonal, contour.

12. Comminuting device according to any of claims 1 to 11, characterized in that at least a portion of the ~~circumferential~~**bottom** wall (16) is configured as a grating.

13. Comminuting device according to any of claims 1 to 12, characterized in that at least one comminution element (28), preferably the comminution element (28a) adjacent to the bottom wall (16), consists of a chain.

14. Comminuting device according to any of claims 1 to 13, characterized in that at least one comminution element (28) consists of an impact member (28b).

15. Comminuting device according to claim 14, characterized in that the impact member (28b) is articulated to the drive shaft (22), preferably swingable about an axis (A) preferably extending parallel to the drive shaft (22).

16. Comminuting device according to any of claims 1 to 15, characterized in that the comminution elements (28) are arranged helically on the drive shaft (22), preferably in such manner that a comminution element (28) nearer to the bottom wall (16) is arranged to run ahead more than a comminution element (28) more distant from the bottom wall (16) in the direction of revolution about the drive shaft (22).

17. Comminuting device according to any of claims 1 to 16, characterized in that the drive shaft (22) is a hexagonal shaft.

18. Comminuting device according to any of claims 1 to 17, characterized in that the comminution elements (28) are arranged on the drive shaft (22) in planes of comminution elements, having a predetermined minimum distance (d_1) from each other, amounting for example to about 120 mm.

19. Comminuting device according to any of claims 1 to 18, characterized in that, between the free end of at least one of the comminution elements (28) and the circumferential wall (14), a predetermined distance (d_3) is provided.

20. Comminuting device according to any of claims 1 to 19, characterized in that at least one annular attachment (38) projecting inward from the circumferential wall (14), preferably of funnel-shaped configuration, is provided.

21. Comminuting device according to any of claims 1 to 20, characterized in that, in the neighborhood of the upper edge of the circumferential wall (14), a charge opening (30) is provided for supply of material to be comminuted.

22. Comminuting device according to claim 21, characterized in that the charge opening (30) extends from the upper edge of the circumferential wall (14) over a predetermined distance towards the bottom wall (16).

23. Comminuting device according to any of claims 1 to 22, characterized in that, in the uppermost plane of comminution elements and if desired also in at least one plane of comminution elements arranged thereunder, only one comminution element (28) is provided.

24. Comminuting device according to any of claims 1 to 23, characterized in that at least the at least one uppermost comminution element (28b') is configured shorter than the remaining comminution elements (28).

25. Comminuting device according to any of claims 21 to 24, characterized in that a supply passage preceding the supply opening (30) is of angled configuration.

26. Comminuting device according to any of claims 1 to 25, characterized in that the drive shaft (22) is rotatably mounted both at the bottom wall (16) and also at a ceiling wall (18) of the comminution chamber (12).

27. Comminuting device according to any of claims 1 to 26, characterized in that the drive motor (24) is connected to the drive shaft (22) by way of a belt drive (26).

28. Comminuting device according to any of claims 1 to 27, characterized in that the speed of the drive shaft (22) is between about 200 rpm and about 2,000 rpm, preferably between about 500 rpm and about 1,000 rpm.

29. Comminuting device according to any of claims 1 to 28, characterized by comprising a connection opening (48) for an exhaust device (49).

ABSTRACT

~~Disclosed is a~~**A** comminuting device ~~(10) comprising~~**includes** a comminuting chamber ~~(12)~~ which has a bottom wall ~~(16)~~ and a circumferential wall ~~(14) that~~**which** extends upwards from the bottom wall ~~(16),~~**. The device also includes** a rotatably driven drive shaft ~~(22)~~ which extends essentially orthogonal to the bottom wall ~~(16)~~, and at least one comminuting element ~~(28a) that~~**which** is disposed next to the bottom wall ~~(16) and~~**. This at least one comminuting element** can be made to perform a rotary movement about the drive shaft ~~(22)~~ by ~~means of said~~**the** drive shaft ~~(22)~~. A plurality of additional comminuting elements ~~(28b)~~ which can be made to perform a rotary **or revolving** movement about the drive shaft (22) by means of the drive shaft ~~(22)~~ are arranged above the ~~inventive~~**at least one** comminuting element ~~(28a) that is located~~**comminuting element disposed** next to the bottom wall ~~(16)~~.

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No.	**Change**	**Text**
1	Insertion	A36473 PCT USA - 071155.0328
2	Deletion	[Translation from German]
3	Deletion	Comminuting Device
4	Insertion	SUBSTITUTE SPECIFICATION
5	Insertion	COMMINUTING DEVICE
6	Insertion	CROSS REFERENCE TO RELATED APPLICATIONS
7-8	Insertion	[0001] This application...their entireties herein.
9	Deletion	Description
10	Insertion	FIELD OF THE INVENTION
11-12	Change	"comminuting" changed to "adevices for comminuting"
13	Change	"comminuting device," changed to "comminuting. In...relates to a device,"
14-15	Change	"device, including a comminution" changed to

		"device, which includes a comminution"
16	Change	"bottom wall, and additionally" changed to "bottom wall, and which is additionally"
17-18	Change	"being set in rotational motion" changed to "being set in revolving motion"
19	Change	"motion by the drive" changed to "motion about the drive shaft by the drive"
20	Change	"drive shaft." changed to "drive shaft"
21	Insertion	BACKGROUND OF THE INVENTION
22-23	Change	"that can be" changed to "By contrast, one object...processes that can be"
24	Insertion	SUMMARY OF THE INVENTION
25-26	Change	"comminuting" changed to "This object is...by aA comminuting"
27-28	Change	"comminuting device of the...above the comminution" changed to "comminuting device which...includes a comminution"
29	Change	"bottom wall, a plurality" changed to "bottom wall, and a plurality"
30	Change	"comminution elements capable of being" changed to "comminution elements that are capable of being"
31	Change	"by said shaft are provided. This" changed to "by said shaft. This"
32	Change	". This ensures that" changed to ". This configuration ensures that"
33-34	Change	"RPMV" [rotor" changed to "RotorprallmühleRotorprallmühle RPMV" [rotor"
35	Change	"mill RPMV] it is tolerable" changed to "mill RPMV] . it is tolerable"
36-37	Change	"RPMV" if the" changed to "RotorprallmühleRotorprallmühle RPMV" if the"
38	Change	". From this" changed to ", which is disposed at...outer jacket. From this"
39	Change	"this catch hopper" changed to "this catch means (e.g., a funnel-shaped hopper"

40	Change	"hopper, the comminuted" changed to "hopper), the comminuted"
41	Change	"be discharged, downward" changed to "be discharged downward"
42	Change	"downward for example." changed to "downward, for example."
43-44	Change	"." changed to "hoppermeans."
45	Change	", a slide valve" changed to "of the opening at will, a slide valve"
46-47	Change	"manageable" changed to "singlejointly manageable"
48-49	Change	"be provided as grating in" changed to "be provided with a grating in"
50	Change	"grating in six of the eight" changed to "grating in the region of six of the eight"
51	Change	"example the opening for" changed to "example the charge opening for"
52	Change	", then the comminution" changed to "about the drive shaft, then the comminution"
53-54	Change	"of at least" changed to "endsend of at least"
55-56	Change	"elements and the bottom wall, with" changed to "elements and the circumferential wall, with"
57-58	Change	"is provided," changed to "set of ringsannular attachment is provided,"
59-60	Change	"Besides, the set of rings may be employed" changed to "Besides, the annular attachment may be employed"
61-62	Change	"fastened to flats, bowed to serve as suspension" changed to "fastened to a bent...serving as suspension"
63-64	Change	"of the comminuting" changed to "to within rangein the region of the comminuting"
65-66	Change	"circumferential interval of the comminuting" changed to "circumferential region of the comminuting"
67-68	Change	"again upon" changed to "elementopening again upon"

69-70	Change	"fluctuations" changed to "feedspeed fluctuations"
71-72	Change	"opening may" changed to "anothera connection opening may"
73-74	Change	"circumferential interval without grating." changed to "circumferential region without grating."
75-76	Change	"grating. This connecting opening may" changed to "grating. This connection opening may"
77	Insertion	
78	Insertion	BRIEF DESCRIPTION OF THE DRAWING
79-80	Change	"the invention" changed to "In the following,Further...of the invention"
81	Change	"the invention will be" changed to "the invention, its...advantages will be"
82-83	Change	"will be illustrated in...to the accompanying" changed to "will be more apparent...and the accompanying"
84-85	Change	"accompanying drawings. ...the drawings:[0026] Fig." changed to "accompanying drawings,...in which: [0026] Fig."
86	Insertion	DETAILED DESCRIPTION OF THE INVENTION
87-89	Insertion	[0030] The present...reference to Figs.. 1-4.
90	Change	"Fig." changed to "In Fig."
91-92	Change	"Fig. 1, a comminuting" changed to "Fig. 1 shows a comminuting"
93	Change	"the invention is quite generally" changed to "the invention, which is quite generally"
94	Change	"generally designated 10. It includes" changed to "generally designated device 10. It includes"
95	Change	"planes one" changed to "comminution element planes one"
96	Change	"are suspended flying" changed to "are suspended in flying"
97	Change	"flying on the drive" changed to "flying/cantilever arrangement on the drive"
98-99	Change	"the height" changed to "beyondalong the height"
100-101	Change	"30 extends beyond the radius" changed to "30 extends along the radius"
102-103	Change	"of the impact" changed to "spacingoffset of the impact"
104	Change	"fragments move by gravity through" changed to "fragments move downward by gravity through"
105	Change	"element planes, downward, being further"

		changed to "element planes, being further"
106	Change	"effect of the members 28b" changed to "effect of the impact members 28b"
107	Change	"distance d_2" changed to "mutual distance d_2"
108-109	Change	"of material" changed to "dragmentsfragments of material"
110-111	Change	"28b and the peripheral wall 14 and/or" changed to "28b and the circumferential wall 14 and/or"
112	Change	"too rapid" changed to "a too rapid"
113	Change	"too rapid a supply of the" changed to "too rapid supply of the"
114	Change	"side surfaces" changed to "lower side surfaces"
115	Change	"outer jacket 34 and the circumferential" changed to "outer jacket 34 in Fig. 3 and the circumferential"
116	Change	"grating 32 after the outer jacket" changed to "grating 32 after being...from the outer jacket"
117-118	Change	"outer jacket 34 has been swung away, for example" changed to "outer jacket 34, for example"
119	Change	"for example in order to" changed to "for example, in order to"
120-121	Change	"RPMV.' Depending" changed to "RotorprallmühleRotorprallmühle RPMV.' Depending"
122	Change	"is supplied" changed to "therefrom at 68 is supplied"
123-124	Insertion	62.62
125-126	Insertion	[0047] It will be...spirit of the invention.
127	Change	"Claims" changed to "Claims"
128-129	Change	"(34) form a single manageable" changed to "(34) form a jointly manageable"
130-131	Change	"portion of the circumferential wall (16) is" changed to "portion of the bottom wall (16) is"
132-133	Change	"Disclosed is a comminuting" changed to "A comminuting"
134-135	Change	"comminuting device (10) comprising a comminuting" changed to "comminuting device includes a comminuting"
136	Change	"comminuting chamber (12)" changed to "comminuting chamber"
137	Change	"bottom wall (16) and a circumferential" changed to "bottom wall and a circumferential"
138-139	Change	"circumferential wall (14) that extends

		upwards" changed to "circumferential wall which extends upwards"
140-141	Change	"bottom wall (16), a rotatably" changed to "bottom wall. The device also includes a rotatably"
142	Change	"drive shaft (22) which extends" changed to "drive shaft which extends"
143	Change	"bottom wall (16), and at least" changed to "bottom wall, and at least"
144-145	Change	"comminuting element (28a) that is disposed" changed to "comminuting element which is disposed"
146-147	Change	"bottom wall (16) and can be made" changed to "bottom wall. This at...element can be made"
148	Change	"drive shaft (22) by" changed to "drive shaft by"
149-150	Change	"by means of said drive shaft" changed to "by the drive shaft"
151	Change	"drive shaft (22)." changed to "drive shaft."
152	Change	"comminuting elements (28b) which can be" changed to "comminuting elements which can be"
153	Change	"perform a rotary movement about" changed to "perform a rotary or revolving movement about"
154	Change	"drive shaft (22) are arranged" changed to "drive shaft are arranged"
155-156	Change	"arranged above the inventive comminuting" changed to "arranged above the at least one comminuting"
157-158	Change	"comminuting element (28a)...is located next to the" changed to "comminuting element...disposed next to the"
159	Change	"bottom wall (16)." changed to "bottom wall."

Statistics:	
	Count
Insertions	94
Deletions	65
Moved from	0
Moved to	0
Style change	0

Format changed	0
Total changes	159